

Summary:

Interplay in Sørkedalsveien – 6 years on Car-bicycle conflict at the junction between Sørkedalsveien and Morgedalsvegen

Conflict registrations at three time points

As part of the Norwegian Public Roads Administration's ongoing campaign to improve the interaction between cyclists and car drivers, the Institute of Transport Economics carried out research into cyclist-driver interaction in 1997 and 2001. At both time points interactions were registered at the same road junction, a T-junction in which a cycle path along Sørkedalsveien crosses Morgedalsvegen. The results from 1997 and 2001 showed a strong reduction in the number of those interactions classed as 'conflicts' between car drivers and cyclists. To determine whether this tendency continued beyond 2001, new registrations were carried out in the autumn of 2007.

At all three time points the registrations were of morning or afternoon rush-hour traffic. They were obtained using a video camera placed on Sørkedalsveien, across from its junction with Morgedalsvegen. In 1997 the registrations were recorded in June, while in 2001 and 2007 they were recorded in September/October. Between 25 and 30 hours of registration were performed at each of the last two time points, compared with three hours of registration in 1997. In 2007, 3165 cycle passes were registered, compared with 2920 in 2001 and 359 in 1997.

Fewer conflicts over time

A 'retreat situation' is defined as a situation in which the cyclist and/or car driver brakes or turns away in order to avoid a collision, while a 'conflict' is a serious retreat situation in which one or both parties must brake suddenly, or carry out some other avoidance manoeuvre suddenly, in order to prevent a collision. The results show a reduction over time in the share of retreat situations that end in conflict at the Sørkedalsveien/Morgedalsvegen junction.

At all three time points around 15 per cent of cycle passes resulted in retreat situations with cars. In 1997 over three per cent of cycle passes resulted in a conflict. In 2001 this share was reduced to 0.7 per cent, and in 2007 a further reduction was observed such that only 0.4 per cent of cycle passes resulted in conflict. The reduction in conflict from 1997 to 2001 is clearly significant, although this does not apply to the reduction observed from 2001 to 2007. Based on a one-sided test, however, the change from 2001 to 2007 is significant at a ten per cent significance level ($p=0.088$).

The reduction in the level of conflict over time could be the result of the road user becoming accustomed to this junction. When the registrations were carried out in 1997, the cycle path was only weeks old and many of the car drivers were possibly unaccustomed to and hence unprepared for cyclists passing on the cycle path.

Certain types of conflict disappear

It is possible to envisage that retreat situations or conflicts can arise in any one of eight different situations, as illustrated below in Figure 1. The total number of retreat situations and conflicts arising in each type of situation in 1997, 2001 and 2007 are shown in Table 1.

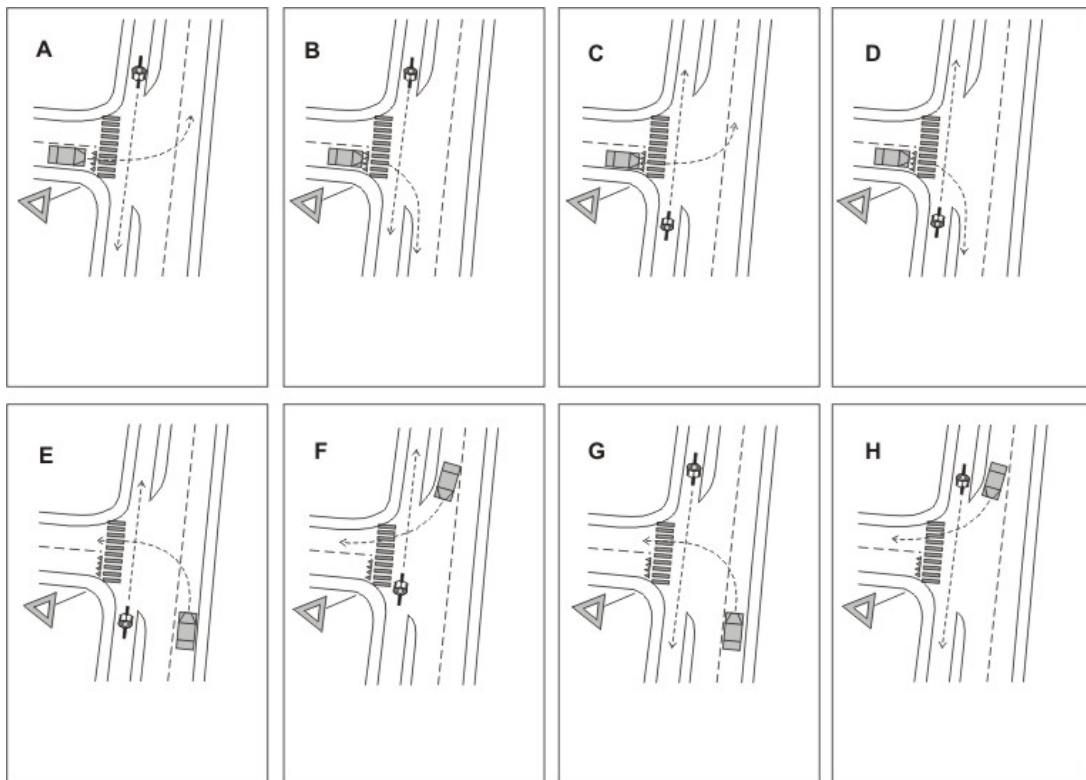


Figure 1. Possible retreat situations between cars and bicycles at the Sørkedalsveien/Morgedalsvegen junction (Sørkedalsveien running from top to bottom).

Table 1. Total retreat situations and conflicts registered at the Sørkedalsveien/Morgedalsvegen junction in 1997, 2001 and 2007.

| | | A | B | C | D | E | F | G | H | total |
|------|--------------------|----|-----|----|----|----|----|----|----|-------|
| 1997 | Retreat situations | 5 | 10 | 1 | 18 | 6 | 5 | 4 | 5 | 54 |
| | Conflicts | 1 | 1 | 0 | 8 | 0 | 1 | 1 | 0 | 12 |
| 2001 | Retreat situations | 35 | 149 | 25 | 53 | 37 | 33 | 33 | 72 | 437 |
| | Conflicts | 4 | 1 | 2 | 6 | 4 | 0 | 1 | 2 | 20 |
| 2007 | Retreat situations | 25 | 155 | 22 | 85 | 48 | 38 | 40 | 27 | 440 |
| | Conflicts | 0 | 4 | 0 | 4 | 4 | 0 | 2 | 0 | 14 |

In 2001 we observed that the situations in which relatively many conflicts arose were those in which the car driver would normally look in a direction other than that from which the cyclist approaches (situation A, C, D and E). In situation D, for example, the car driver would normally look to the left while the cyclist comes from the right. Likewise in situation E the car driver would look to the right but the cyclist comes from the left. Further, we supposed that the main problem in situations A and C was that they place a large cognitive demand on the car driver; they must attend to and gather information from both directions and at the same attend to the possibility of cyclists crossing on the cycle path.

The results from 2007 show a slightly different pattern. No conflicts were registered in situations A, C, F and H, but conflicts still occurred in situations D and E. In situation B more conflicts were registered than in 2001.

Change in pattern a result of situation-specific learning?

The results imply that further learning has occurred from 2001 to 2007, but that this varies between situations. One mechanism for this could be the effects of learning over time manifest themselves differently in different situations because the chances that the car driver can learn and adapt their behaviour varies according to the particular situation (A-H). Based on such a mechanism we propose that there are two conditions that determine learning and learning outcome at this junction:

1. Exposure to potential danger in a specific situation (A-H).
2. Level of distraction in that situation (influencing the road user's subsequent ability to adjust their behaviour on the basis of 1.).

Condition 1 holds that when road users experience potential danger in different situations, they learn from it and try to adjust behaviour on future approaches to the junction in an attempt to avoid any subsequent dangerous situation. Condition 2 holds that the ease with which one can adjust one's behaviour varies according to the situation.

It is easy to imagine that in situations A and C the driver can learn that cyclists can come across their path and that they therefore become more inclined to retreat before they reach the cycle path. These are situations in which they would in any case need to hold back from the traffic on Sørkedalsveien, and so drivers would lose little by adjusting the distance at which they hold back.

Car drivers will also be able to learn in situations B and D but since here they need only to watch for cars approaching from the left, they can save more time by doing so while simultaneously trying to slip into any "first and best" time window on Sørkedalsveien. In trying to gain time there is less cognitive capacity for cycle checking.

Situation E has the greatest proportion of conflicts in 2007 and it is the most complicated situation for the car driver to handle. They must deal with road traffic that approaches both from in front and behind, in addition to possible cyclists approaching from behind on the cycle path. In such situations drivers can also feel pressure to move from a line of cars building up behind them. Moreover, the

cyclist approaches from a direction other than that in which the driver is focused. In other words the situation can be complicated and stressful and has high cognitive demand. It is reasonable to suppose that it would be more difficult for drivers to learn how to deal with situation E.

We registered no conflicts in situations F and H in 2007. In these situations the road users only need to concern themselves with one other road user, and even if they have the potential for conflict, these are cognitively ‘quiet’ situations which are easier to deal with, both for cyclist and driver.

Situation-specific changes in retreat behaviour

An additional question raised during the project is whether over time car drivers have become more willing to retreat for cyclists. However we observed little change in overall retreat behaviour. In all three periods the car drivers retreated in about 60 per cent of retreat or conflict situations, cyclists retreated about 20 per cent of the time and in the remainder of situations both parties retreated. In the latter situations we also noted which party drove away first. In 2001 and 2007 it was almost always the cyclist that drove away first. (This was not recorded in 1997.)

Even if there are only small changes over time according to overall figures, significant differences emerge when retreat behaviour is analysed according to specific situation (A-H, Figure 1). In 2007 the car drivers retreated significantly more in situations A and C than they did in 2001, a finding which gives further support that car drivers have learned to hold themselves back more in these situations. On the other hand we find that the drivers retreat significantly less in situations F and H, possibly because, as the data also suggest, these are situations in which the cyclists have learned to retreat more over time. Situation H in particular is a classic ‘cycle case’, infamous to cyclists, and therefore easy to recognise and learn from.

Conclusion

In summary we conclude as follows:

- The level of conflict at this junction has been reduced because road users have learned from exposure to potential dangers in different types of retreat situation.
- Drivers can adjust the way in which they approach this junction (on the basis of exposure to potential danger) better in those situations in which there are few distractions than in those situations in which there are many distractions, as illustrated by the reduction in the share of conflicts in those situations in which there are few elements that compete for the driver’s attention.

As noted in the last report of conflict registrations at this junction, several studies have shown that the introduction of pedestrian crossings and cycle paths often

does not have the expected accident-reducing effect. Explanations have been offered that the speed on the cycle path often increases and that the new junctions formed by pedestrian crossings or cycle paths with roads introduce problems. However, our results indicate that the accident risk associated with newly built cycle paths may reduce over time, at least in areas where there is a lot of local traffic and the possibility of learning to deal with or manage actions that arise in different situations.

The registrations imply that the interplay is not improved through learning in every situation. Indeed, perhaps the most important observation in this study is that there was no change in retreat behaviour in situation E from 2001 to 2007, either for drivers or cyclists, and that it is this situation that now contains the highest share of conflicts. The implication is that this situation is too complex for either party to apply what they have learned from prior exposure to potential danger. It is interesting to note that the Public Roads Administration recommends that where cycle paths meet junctions such as the one at Sørkedalsveien/Morgedalsvegen, they should be pulled further away from the continuous road leg. Such a solution would probably reduce the cognitive strain on road users and thereby decrease the number of conflicts in these kinds of junctions.